

Remarks

Claims 1, 7, 20, 25, 26, and 33 are amended and claims 34-36 are added herein. Claims 1-18 and 20-36 will be pending upon entry of this amendment.

Claims 1, 7, 20, 25, 26, and 33 have been amended herein for the sole purpose of improving their form and not for reasons relating to patentability.

The following remarks are responsive to the Office action mailed March 30, 2007.

Response to Rejection of ClaimsClaim 1

Claim 1 is directed to a mass produced absorbent article. The absorbent article comprises an absorbent member adapted to retain liquid therein, at least one other component operatively connected to the absorbent member in a unit, and an image. The image includes at least one ink having the color of one of cyan, magenta, yellow and black. The image is printed in a non-contact manner on at least a portion of the at least one other component by ink jets at a resolution of about 100 dpi with the at least one other component moving under the ink jets at a speed of at least about 30.5 mpm (100 fpm). Any area in the image having a cyan colored ink applied at maximum threshold thereto has a coverage area ratio of cyan colored ink of at least about 3%, any area in the image having a magenta colored ink applied at maximum threshold thereto has a coverage area ratio of magenta colored ink of at least about 5%, any area in the image having a yellow colored ink applied at maximum threshold thereto has a coverage area ratio of yellowed colored ink of at least about 6%, and any area in the image having a

black colored ink applied at maximum threshold thereto has a coverage area ratio of black colored ink of at least about 6%.

As mentioned in the specification, the recited article has an image that is darker (i.e., has more vibrant color) when the image is applied at high line speeds (e.g., 100 fpm or greater) even though the output of the print heads is set to dispense an unconventionally low quantity of ink (100 dots per inch). In other words, the image on the recited article is more vibrant, brighter, and stands out better visually than those of the prior art even though it is formed at a high line speed and with less ink. See page 22, paragraph [0050] of applicants' specification. At least to the inventors, this was counterintuitive and a surprising result, the intuitive solution to increasing the line speed being to increase the ink output to keep up with the faster moving article.

Claim 1 is thus submitted to be nonobvious in view of and patentable over the references of record, and in particular, U.S. Patent No. 5,503,076 (Yeo) in view of U.S. Patent No. 4,680,645 (Dispoto et al.), in that whether considered alone or in combination the references fail to show or suggest an absorbent article comprising an image printed in a non-contact manner on at least a portion of the at least one other component by ink jets at a resolution of about 100 dpi with the at least one other component moving under the ink jets at a speed of at least about 30.5 mpm (100 fpm).

Yeo (with particular reference to Figs. 1 and 2 thereof), discloses a multi-color printed nonwoven web laminate 10 having a fibrous nonwoven facing layer 12, a substrate layer 14 and a plurality of adhesive-inks 16. The adhesive inks 16 adhesively bond the facing layer 12 to the substrate layer 14, and impart a multi-color pattern which is visible through the nonwoven facing layer 12. Yeo further discloses that flexographic and ink-jet

printing can be used to apply the adhesive inks 16. However, as noted in the Office action, Yeo fails to teach or suggest the ink is applied at a resolution of about 100 dots per inch (dpi) as recited in claim 1. In fact, Yeo is also completely silent regarding the number of dpi used to apply the adhesive ink to the article. Even more so, Yeo is silent as to any relationship between the resolution and the line speed of the component onto which the image is printed.

Dispoto et al. does not add to the teachings of Yeo. Rather, Dispoto discloses a method of printing a gray scale image wherein the size of the dots being deposited onto the substrate (i.e., paper) are varied. Dispoto et al. indicate that images printed on white paper using a printer at a resolution of 100 dpi and having 16 levels of dot sizes can produce an excellent quality image. Dispoto et al. however is completely silent as to a line speed at which the paper is moved past the print head of the printer (or the rate at which the print head itself moves over the paper). That is, one skilled in the art cannot glean from Dispoto that a 100 dpi resolution is achievable or beneficial for paper moving at the line speed recited in claim 1.

Thus, nothing in Dispoto et al. or Yeo is contrary to the conventional wisdom in the art prior to the claimed invention that printing high quality images on articles being manufactured at high line speeds (i.e., greater than 100 fpm) required high resolution (i.e., 720 dpi or greater) to produce a suitable image. It is the combination of low resolution (i.e., 100 dpi) and high line speed (i.e., 100 fpm) at which the printing is occurring that renders the claimed invention patentable over the prior art including Yeo and Dispoto et al. In other words, there is no reason evident in Yeo or Dispoto et al. from which one skilled in the art would find it obvious to print images at

a low resolution (e.g., 100 dpi) onto a component moving a high line speed (i.e., 100 fpm), or otherwise predictable that such a feature would result in the recited vibrant image.

As set forth in the Declaration filed January 15, 2007, absorbent articles such as diapers and training pants are typically manufactured in a line process in which the various components of the article are assembled together at high speeds such as 100 feet per minute (as mentioned in Yeo) and more often about 1,200 feet per minute or more. Prior to the present invention, due in part to print head limitations, graphic images that appear on such articles were applied by ink jet printing in an off-line process in which the graphic was imprinted on a film or non-woven web off-line, at lower speeds and over multiple passes of the web past the print head. The printed web was subsequently introduced to the manufacturing line at the higher line speed. The resolution of such images was about 300 dpi to about 600 dpi or even higher.

The quality of an image produced by a drop on demand ink jet printer has long been thought to be a function of the resolution of the image, i.e., a certain area of coverage of the substrate by the ink. The image resolution is typically defined in terms of the surface area of the web covered by a given amount of ink, and more particularly the ink dot density which is commonly given as dots-per-inch (dpi). A greater dpi has thus been associated with a greater resolution, and hence an increased quality ink jet image on the web. For example, the reference text submitted with the Declaration notes that conventional printing is typically performed at a resolution of 254-770 dpi, and for textile printing the resolution should be about 720 dpi.

The problem to be addressed by the inventors was to print at higher speeds than were unavailable in off-line printing

processes, while maintaining or increasing the resolution of the image printed on the web. Achieving this would allow the web to be printed on the main assembly line, i.e., at line speed, thereby reducing the number of processing steps, increased flexibility in changing graphics during manufacturing, and providing other manufacturing efficiencies and cost savings. The teachings known to those skilled in the art at the time of the invention dictated that to maintain the image quality of the graphic at the desired higher line speeds, the resolution of the graphic image on the web would have to at least stay the same (e.g., 300 to 600 dpi), meaning that the print head would have to output more ink as the line speed increased. Neither Yeo nor Dispoto et al. teach or suggest otherwise.

U.S. Patent No. 6,957,884, which is incorporated by reference into the present specification at paragraph [0043], page 17 as U.S. Patent Application No. 10/330,515, also discusses the shortcomings of ink jet printers. For example, the '844 patent states that "there has been much progress in the area of piezo jet printing however, heretofore, the piezo jet printers were limited in that they were not able to handle high-speed process printing" (col. 1, lines 38-41), and "piezo jet printing apparatus currently available lack the ability to create multi-color process images at high speeds" (col. 1, line 66 through col. 2, line 1). Applicants point out that the date of the '884 patent is significantly closer to the date of the present invention than Dispoto et al. and is submitted to be more indicative of the conventional wisdom in the art at the time of this invention than Dispoto et al. The '844 patent was filed on December 27, 2002 whereas Dispoto et al. regarding highline speed printing.

During experiments conducted by the inventors, however, the graphic produced at higher dpi (using faster print-head output

and more ink) and higher line speed rates was blurred, or smeared. Also during these experiments, the inventors increased the line speed (at which the printing occurred) even further, thus exceeding the ink delivery rate capabilities of the print head to see just how high of a line speed the print head could be used with. Exceeding the capabilities of the print head certainly is not a solution that would have been obvious to one skilled in the art. Indeed, this resulted in the image resolution dropping substantially below 300 dpi. Unexpectedly and unpredictably, the quality of the image was as good as, or better than, images previously produced at 300-600 dpi and slower line speeds and certainly better than images produced at 300-600 dpi at the higher line speeds.

As a result of their experimentation, the inventors determined that high quality images could be produced on absorbent articles moving at line speeds of 30.5 meters per minute (100 feet per minute) or greater using ink jet printing with a resolution of about 100 dots per inch (dpi). Such a result was unpredictable and unexpected in view of the previously common belief that increasing line speeds required a more rapid ink delivery rate (relative to the line speed) to the web, not a lower rate.

The position taken by the Office in this Office action is that it would have been obvious to modify Yeo in view of the teachings of Dispoto et al. to have the recited image of Yeo printed at 100 dpi because the recited resolution according to Dispoto et al. can be used to produce an excellent quality image. However, Dispoto et al. fail to disclose the rate at which the paper moves (e.g., the line speed of the paper) past the print head and further fail to disclose or suggest any relationship between the image resolution and the line speed. Indeed, based on the commonly understood relationship between

resolution, line speed and image quality at the time of applicants's invention, one would expect that the paper movement speed in Dispoto et al. would have to be relatively low (i.e., substantially slower than 100 fpm).

The Office's position thus goes against the commonly understood relationship between resolution, line speed, and image quality at the time of the applicant's invention. As discussed previously herein and the attached declaration, the recited image having a resolution of 100 dpi unexpectedly provides the desired image quality that was heretofore achieved only at higher resolutions and lower line speeds. Accordingly, the recited reduced resolution, at higher line speeds, is counterintuitive and contrary to the teachings of the prior art and the knowledge of those skilled in the art at the time of the present invention.

Moreover, the Office recognizes that Yeo does not disclose the coverage area ratios of the colored ink recited in claim 1. See page 3, paragraph 3 of the Office action. Dispoto, which was relied on solely for its teaching of printing at 100 dpi, also fails to teach or suggest the recited coverage area ratios. Thus, the Office has taken the position that these are merely result effective variables since they are a function of the "overall article size".

However, the recited coverage area ratios are a function of the image size and not the article size as asserted by the Office. Specifically, claim 1 recites, in part, that

any area in the image having a cyan colored ink applied at maximum threshold thereto has a coverage area ratio of cyan colored ink of at least about 3%, **any area in the image** having a magenta colored ink applied at maximum threshold thereto has a coverage area ratio of magenta colored ink of

at least about 5%, **any area in the image** having a yellow colored ink applied at maximum threshold thereto has a coverage area ratio of yellowed colored ink of at least about 6%, and **any area in the image** having a black colored ink applied at maximum threshold thereto has a coverage area ratio of black colored ink of at least about 6%.
Emphasis added.

Thus, each of the four coverage area ratios provided in claim 1 are dependent directly on the area in the image having the specific colored ink therein. As a result, when a specific colored ink is used in the image, a sufficient amount of ink is applied to the article to produce a high quality, vibrant image thereon. Accordingly, the coverage area ratios recited in claim 1 are not a result of the overall article size as asserted by the Office.

For all of the above reasons, claim 1 is submitted to be non-obvious in view of and patentable over the references of record including Yeo in combination with Dispoto et al.

Claims 2-18 depend either directly or indirectly from claim 1 and are submitted to be patentable over the references of record for at least the same reasons as claim 1.

Claims 11 and 12

Claim 11, which depends indirectly from claim 1, further recites that the image includes multiple separable design elements, none of the design elements being smaller than about 0.64 centimeters (0.25 inches) in height. Claim 12 depends from claim 11 and further recites that one of the design elements constitutes a focal design element, the height of the focal design element being at least about 1.91 centimeters (0.75 inches).

Neither Yeo nor Dispoto et al. disclose the dimension of a design element, nor would it would have been obvious to one of ordinary skill in the art to modify Yeo or Dispoto et al. on the basis that discovering the optimum value of a result effective variable involves only routine skill in the art. See pages 4 and 5 of the Office action citing *In re Boesch and Slaney*.

Such a position appears to be the very position rejected by the court in *In re Antonie* 195 USPQ 6 (CCPA 1977). In particular, the court noted that an assertion that it would always be obvious to one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system is improper "if there is no evidence in the record that the prior art recognized that particular parameter affected the result. *Id.* at 8 (emphasis added). Thus, the court made it clear that the recognition of a particular parameter as a result-effective variable must come from the cited reference.

In this case, neither Yeo nor Dispoto et al. teach that the dimension of the design element is a result-effective variable.

For these additional reasons, claims 11 and 12 are further submitted to be non-obvious and patentable over the references of record.

Claim 20

Claim 20 is directed to a mass produced absorbent article comprising an absorbent member adapted to retain liquid therein, at least one other component operatively connected to the absorbent member in a unit, and an image including at least one process color ink, the image being printed in a non-contact manner on at least a portion of said at least one other component by ink jets, the image including at least one separable design element being outlined in one selected color

and being free of said selected color as shading in an interior of the design element, the design element having a height of no less than about 0.64 centimeters (0.25 inch).

Claim 20 is submitted to be non-obvious in view of and patentable over the references of record, and in particular Yeo in view of Dispoto et al., for reasons similar to those set forth above in connection with claims 11 and 12. That is, whether considered alone or in combination the references fail to show or suggest an absorbent article comprising a design element having a height of no less than about 0.64 centimeters (0.25 inch). In particular, neither Yeo nor Dispoto et al. teach that the dimension of the design element is a result-effective variable. As such, one skilled in the art would not have found it obvious to modify Yeo or Dispoto et al. in the manner advanced in the Office action.

Claims 21-32 depend from claim 20 and are submitted to be patentable over the references of record for at least the same reasons as claim 20.

Claim 33

Claim 33 is directed to a mass produced absorbent article comprising an absorbent member adapted to retain liquid therein, at least one other component operatively connected to the absorbent member in a unit, and an image including at least one ink having the color of one of cyan, magenta, yellow and black, the image being printed in a non-contact manner on at least a portion of said at least one other component by ink jets at a resolution of about 100 dpi with the outer cover moving under the ink jets at a speed of at least about 30.5 mpm (100 fpm), wherein a color difference (DE*) value for any cyan colored ink in the image as compared to a background color of said at least one other component on which the image is printed is at least

about 6, the DE* value for any magenta colored ink in the image has a color difference (DE*) of at least about 9, the DE* value for any yellow colored ink in the image has a color difference (DE*) of at least about 8, and the DE* value for any black colored ink in the image has a color difference (DE*) of at least about 6.

Claim 33 is submitted to be non-obvious in view of and patentable over the references of record, and in particular Yeo in view of Dispoto et al., for the same reasons set forth above with respect to claim 1. That is, whether considered alone or in combination the references fail to teach or suggest the recited absorbent article wherein the image is printed in a non-contact manner on at least a portion of the at least one other component by ink jets at a resolution of about 100 dpi with the outer cover moving under the ink jets at a speed of at least about 30.5 mpm (100 fpm).

Discussion of New Claims

Claim 34

New claim 34 depends from claim 1 and recites that the the image contains ink applied to said at least one component by the ink jet with dots having a uniform volume of ink. Support for claim 34 can be found in paragraph [0043], page 17 of the specification and in U.S. Patent Application No. 10/330,515, which is incorporated by reference into the present specification at paragraph [0043], page 17.

The crux of the invention taught by Dispoto is that the dot sizes are variable to correct errors in gray-scaling in order to achieve a 100 dpi image. In fact, Dispoto teaches the use of 16 different dot sizes to correct errors associated with gray scaling. Thus, Dispoto expressly teaches away from dots having

a uniform volume of ink as recited in claim 34. Yeo lacks any teaching or suggestion whatsoever regarding the sizes of the dots used during ink jet printing. Moreover, nothing in Yeo would suggest or motivate one of ordinary skill in the art to do violence to Dispoto's invention by having uniform dot sizes.

As a result, claim 34 is submitted to be further non-obvious in view of and patentable over Yeo in combination with Dispoto et al.

Claim 35

New claim 35 depends from claim 1 and recited that the image comprises ink dots of generally uniform size. As mentioned with respect to claim 34, Dispoto teaches the use of 16 different dot sizes to correct errors associated with gray scaling and thereby expressly teaches away from ink dots of generally uniform size as recited in claim 34. Yeo lacks any teaching or suggestion whatsoever regarding the sizes of the dots used during ink jet printing. Moreover, nothing in Yeo would suggest or motivate one of ordinary skill in the art to do violence to Dispoto's invention by having dot of generally uniform size.

As a result, claim 35 is submitted to be further non-obvious in view of and patentable over Yeo in combination with Dispoto et al.

Claim 36

New claim 36 depends from claim 1 and recites that the at least one other component comprises a non-woven material, the image being disposed on the non-woven material.

Those skilled in the art of printing will readily appreciate that printing on non-woven material is more difficult than printing on standard paper because of the substantial

higher void space of the non-woven material. During the printing process, a significant amount of ink is captured by the voids in the non-woven material which inhibits the ink from spreading laterally outward. Again, the conventional wisdom in the art of printing, prior to this invention, would be to add more ink to compensate for the ink being captured by the voids.

While Yeo discloses printing on non-woven material, one of ordinary skill in the art would not be motivated by Dispoto et al. to print on a non-woven material at 100 dpi because doing so goes against the conventional wisdom in the art. Dispoto et al. is directed specifically to printing on paper which is much denser and has much less void space. As a result, it is easier to print on paper than a non-woven material because ink is not captured by the voids. Instead, it is held near the surface of the paper where it is clearly visible. Thus, it takes less ink to print on paper than on non-woven to achieve the same or nearly the same quality image. Accordingly, one of ordinary skill in the art at the time of this invention would not print on a non-woven as taught by Yeo at a high line speed and 100 dpi as disclosed by Dispoto et al. because the skilled artist would have believed a significantly greater dpi would be necessary to achieve a quality image.

For these additional reasons, claim 36 is submitted to be further non-obvious in view of and patentable over Yeo in combination with Dispoto et al.

Conclusion

In view of the foregoing, favorable consideration and allowance of claims 1-18 and 20-36 is respectfully requested.

Respectfully submitted,

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